

# FUNCTIONAL CAPACITY EVALUATION & DISABILITY

Joseph J. Chen, MD

## ABSTRACT

**Function, Impairment, and Disability are words in which many physicians have little interest. Most physicians are trained to deal with structure and physiology and not function and disability. The purpose of this article is to address some of the common questions that many physicians have with the use of functional capacity evaluation and disability and also to provide a unifying model that can explain the medical and societal variables in predicting disability. We will first define the functional capacity evaluation (FCE) and explore the different types available as well as their uses. We will review several studies exploring the validity and reliability of the FCE on healthy and chronic pain patients. We will examine the few studies that look into whether an FCE is predictive of return to work and whether an FCE is predictive of disability. In the second half of this article, we will focus on the Assessment of Disability from the origins of the United States Social Security Administration to a bold new concept, the World Health Organization's International Classification of Function, Disability and Health.**

## FUNCTIONAL CAPACITY EVALUATION: WHAT IS IT?

In order for us to assess function, ideally we would like an instrument that can reliably measure the functional physical ability of a person to perform a work-related series of tasks. Terms used to judge reliability include intra-rater reliability, test-retest reliability, and inter-rater reliability. Additionally, an FCE instrument should be valid. A valid instrument should measure what it intends. Face validity implies that the test appears to measure what it intends to measure and is plausible. Content validity implies the test seems related to the construct which it is intended to measure. Concurrent validity, or criterion-related validity, implies the test is well correlated with an established "gold standard." Although we would ideally like all tests to be measured against such a "gold standard," much of medicine cannot be measured as such. The function of an individual is definitely not something that has a universal "gold

standard." Construct or convergent validity implies that the test is well correlated with a theoretical expectation, something researchers should be able to elucidate.

Over the past twenty years, many researchers have tried to develop functional capacity evaluation instruments. Matheson provided one of the earliest examples in 1984. Isernhagen followed in 1988 with the suggestion that a multidisciplinary team should assist in determining a person's functional capacity. Hart in 1994 also advocated a physician and physical therapist working in conjunction to assess a patient's resulting impairment. There are approximately 10 different types of commonly used functional capacity evaluations. These include the Blankenship, Ergos Work Simulator and Ergo-Kit variation, the Isernhagen Work System, Hanoun Medical, Physical Work Performance Evaluation (Ergoscience), WEST-EPIC, Key, Ergos, ARCON, and AssessAbility.

## WHY WOULD ONE USE A FUNCTIONAL CAPACITY EVALUATION?

Functional Capacity Evaluations are used for a variety of reasons. One can use an FCE to develop a treatment program, to measure the physical abilities of patients before and after a rehabilitation program, to modify a rehabilitation treatment, to evaluate whether an injured worker can work, and to determine when he/she can return to work.

## SO ARE FUNCTIONAL CAPACITY EVALUATIONS RELIABLE AND VALID?

Gottebarger and Wind et al.<sup>1</sup> studied 4 of the more common functional capacity evaluation instruments and identified 12 papers which assessed either the reliability or validity of these instruments. They found that the Isernhagen Work System had consistent inter-rater reliability and predictive validity, but the intra-rater reliability was not rigorous enough for conclusion. Without a gold standard with which to compare, neither the Ergo Work System nor the Ergo Kit system demonstrated concurrent validity. There was no study found that documented the reliability and validity of the Blankenship System. The authors concluded that more rigorous studies are needed to demonstrate the reliability and validity of Functional Capacity Evaluations especially the Blankenship, Ergo Work System, and Ergo-Kit systems. They did find that the reliability of the Isernhagen Work System was good. Another study by Reneman<sup>2</sup> in 2004 studied

---

Department of Orthopaedics & Rehabilitation  
University of Iowa Hospitals and Clinics

28 adults with the Isernhagen Work System, during a 2 day evaluation. However, a review of that article demonstrates two patients who developed acute low back pain “unrelated” to the first testing session. Therefore, two subjects returned for the second test 2-3 weeks later. However, 1 developed acute low back pain after the first session and performed only half of the items on the second session. Although this study demonstrated reliability and validity of the Isernhagen Work System, a 10% minor complication rate of the development of back pain can be troublesome when testing patients who already have back pain.

So, naturally our next question is how reliable and valid are functional capacity evaluations in patients with chronic back pain? Brouwer and Reneman<sup>3</sup> investigated the test-retest reliability of the Isernhagen Work Systems Functional Capacity Evaluation in patients with chronic low back pain. They studied 30 adults with chronic back pain and asked them to complete two Functional Capacity Evaluation sessions within 2 weeks. Twenty-seven patients completed both sessions, and there was partial data for 2 patients. They defined some statistical variables as reliable and found that most of their variables were indeed reliable. However, there were 4 subtests that did not achieve their agreed upon standard of reliability.

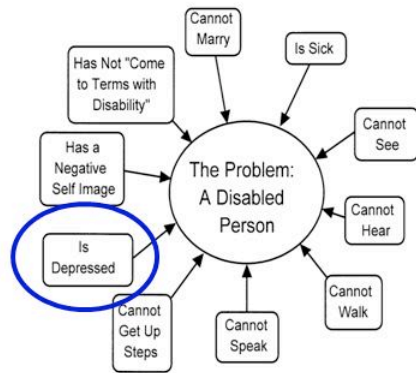
If we have evidence that a Functional Capacity Evaluation is indeed somewhat reliable and valid, we next should focus on this instrument’s ability to predict a patient’s return to work. Gross, Battle, and Cassidy<sup>4</sup> evaluated the prognostic value of functional capacity evaluations in patients with chronic low back pain in a 2-part study in *Spine* in 2004. They found that the floor to waist lift test was predictive of the number of tasks failed. Some other researchers found disagreements in how the authors defined their endpoint in return to work and time until the claim was closed. It is common for a completed functional capacity evaluation to result in the closure of a claim, though the actual performance on the FCE may not be predictive of return to work. In essence, by having a functional capacity evaluation, a patient is likely to be put in a position of deciding whether he or she is willing to return to work. The closure of a claim often results in a proximate suspension of disability benefits. This suspension of disability benefits was observed in many studies an average of 32 days after the completion of a functional capacity evaluation. Some other flaws include that there were some unemployed patients who were tested who had no specific return to work opportunities. They concluded that the influence of psychosocial and contextual factors on return to work are significant. They recommended that further studies of return to work would preferably use cohorts of clients

who have a realistic option of returning to work within the same company. In addition, they found that time off work may actually be a stronger predictor of return to work. In summary, they concluded that functional capacity evaluations are most accurately considered behavioral tests influenced by many factors, including physical ability, beliefs, and perceptions. Therefore, these results should be interpreted within the subject’s broad personal and environmental context.

So can a functional capacity evaluation predict sustained recovery? In the second part of the Gross and Battle<sup>5</sup> study, the authors tried to evaluate the prognostic value of functional capacity evaluations in patients with chronic back pain. They defined sustained recovery as no new claim of total temporary disability within the time period studied. Several researchers had trouble with this definition because some employees may have a new injury in a different part of the body with the resumption of total temporary disability benefits. They also defined sustained recovery as no new claim opened and no old claim reopened. They found that 46 of the 226 patients or 20% had recurrent low back pain following their functional capacity evaluation. Surprisingly, those who had the lower number of failed tests were actually associated with a higher risk of recurrence. Perhaps these were the patients that were physically doing well, but had some motivational or psychosocial barriers that were not adequately addressed. Apparently, the clinicians felt it was easier to get them back to work than to address those difficult issues. Therefore, the authors concluded that the ability of an FCE to identify claimants who are safe to return to work is suspect. Perhaps the FCE process and its administration are only as good as the examiner. In a follow-up of these studies,<sup>6</sup> the authors concluded “performance on functional capacity evaluations is influenced by physical factors, perceptions of disability, and pain intensity. Therefore, FCEs should be considered behavioral tests influenced by multiple factors including physical ability, beliefs, and perceptions.”

So, if in fact an FCE is primarily a behavioral test without a true gold standard, we must reexamine our concepts of disability. The Social Security Administration was developed in 1954 in an effort to ensure that those individuals in our society who could not function without state or federal assistance had the ability to live within our society. Similarly, the American Medical Association was asked to provide some type of objective measurement of disability. Perhaps the oldest system of disability was the McBride system, which was based upon the workers compensation boards in 1936. The American Academy of Orthopaedic Surgeons developed a manual in 1962 to incorporate common orthopaedic injuries and define the associated disability with these

## The Individual (Medical) Model



## Social Model of Disability

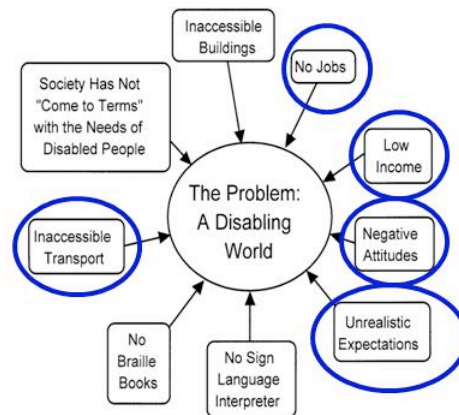


Figure 1. Individual v. Social Models of Disability.

injuries. *Kessler's Disability: Determination and Evaluation* was published in 1970.

So we now get back to one of our original questions—what is the difference between impairment and disability? Impairment is defined by the AMA Guides as an alteration of an individual's health status that has been assessed by medical means. The Florida Impairment Schedule defines an impairment as an anatomic or functional abnormality or loss after MMI has been achieved. The common thread with impairment is that the problem is typically with the organ or body part. Impairments can be minor (e.g., a finger amputation), or devastating such as a cervical spinal cord injury resulting in quadriplegia. None of these definitions include the effect of the impairment onto the individual's ability to function in society. Disability is the term used to describe this relationship and relates to an individual's inability to complete a task or duty. Common themes include consideration of many factors beyond impairment, beyond loss or deficit in psychological, physiological, anatomic structure. Disability encompasses vocational, educational, psychosocial, and financial factors.

### SO WHY CAN WE NOT PREDICT DISABILITY BETTER?

Is it a result of an inadequate understanding of anatomy and physiology? Probably not. Our CT scanners and MRI scanners have become increasingly better at spatial resolution. Is it a result of an inadequate understanding of function? Probably not since there are

some instruments that are valid and reliable in assessing our physical capacity. Instead, it is most likely due to a failure to define disability. We can all recognize a disabled child with spina bifida or cerebral palsy. There are many disabled young children who have attended mainstream schools, received excellent education, have essentially no or few activity limitations, and participate fully in society. Why does a physically adept masonry worker who had at least the same or more opportunities in society, acquire a "disabled" label at the age of 45 simply due to back pain?

Perhaps a better model exists for evaluating structure, function, activity limitations, and participation in society. Though many factors contribute to the determination of disability, the common ones include physical, cognitive, vision, and hearing. However, mental health, culture, social institutions, and physical environments can also be variables that are necessary to control for when evaluating disability.

In our medical practices, we are very structure oriented. We rarely have difficulty identifying patients who cannot see, hear, etc . . . Physicians trained to treat patients with chronic pain are ever more adept at identifying depression and making appropriate treatment referrals.

The Social Model of Disability exists upon a spectrum that defines the degree to which an impairment is disabling in relation to individual attitudes and societal structure. The social environment may actually disable the person. It may be society's response or lack

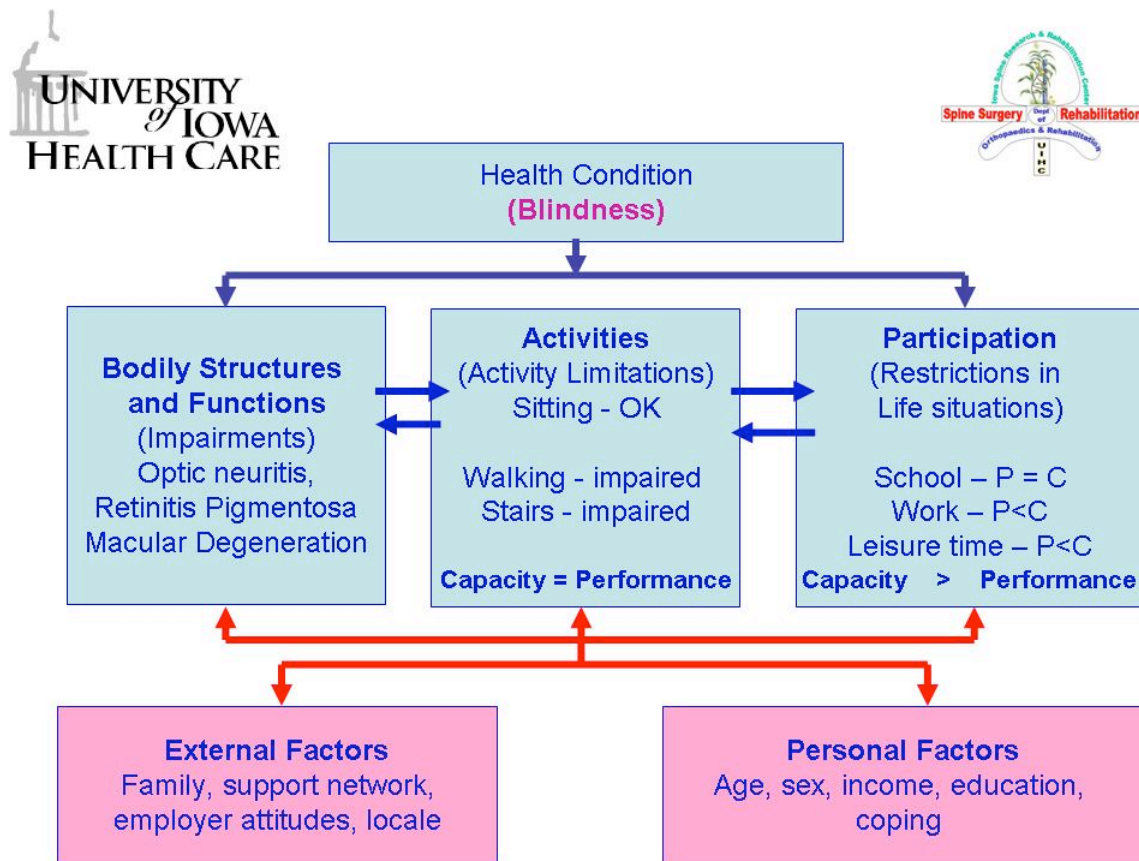


Figure 2. ICF Model for Blindness.

of response that forms the basis of social disadvantage experienced by these disabled persons. This model attempts to direct rehabilitation efforts toward society to increase access to services and to include disabled people into societal activities.

However, many of our patients complain to us that they do not have access to jobs, do not have the training to go back to work, do not have the finances to retrain or the education to make a change. These are societal factors that clearly influence disability determination. While it is not uncommon to think that all patients need to pull themselves up by the bootstraps, this is an unrealistic expectation.

More recently, the World Health Organization commissioned the International Classification of Functioning, Disability, and Health.<sup>7</sup> This new classification system is based upon a biopsychosocial model of disease of which pain physicians are very aware. It includes the body or organ systems that are affected but also adds a dimension of functioning to incorporate all bodily functions, activities, and participation. Participation restrictions are dimensions of activities that an individual is unable to perform at a level appropriate to their capacity. Clearly,

one can see that a disease process affects the individual as well as the way he interacts with his environment.

Let us explore a debilitating condition like blindness within the context of the ICF model (See Figure 2). There are numerous disease processes such as macular degeneration, retinitis pigmentosa, and optic neuritis that produce obvious structural and physiologic organ system abnormalities. The impact these diseases have upon our personal ability to ambulate, dress, and groom ourselves must be examined. Participation in some life activities, like driving, is impossible and this could be rated when their performance is at full capacity. However, without Braille books or Seeing Eye dogs within their environment allowing them to participate in societal activities, the performance of the visually impaired could be significantly less than their capacity with these adaptive aids. A patient's motivation and social support of course are integral parts of their overall level of function.

If we next imagine how children with spina bifida can fit within this model (Figure 3), we can see that they may have impairments in lower extremity strength, mobility, bowel and bladder control and skin sensation. Children's functional abilities can be enhanced with



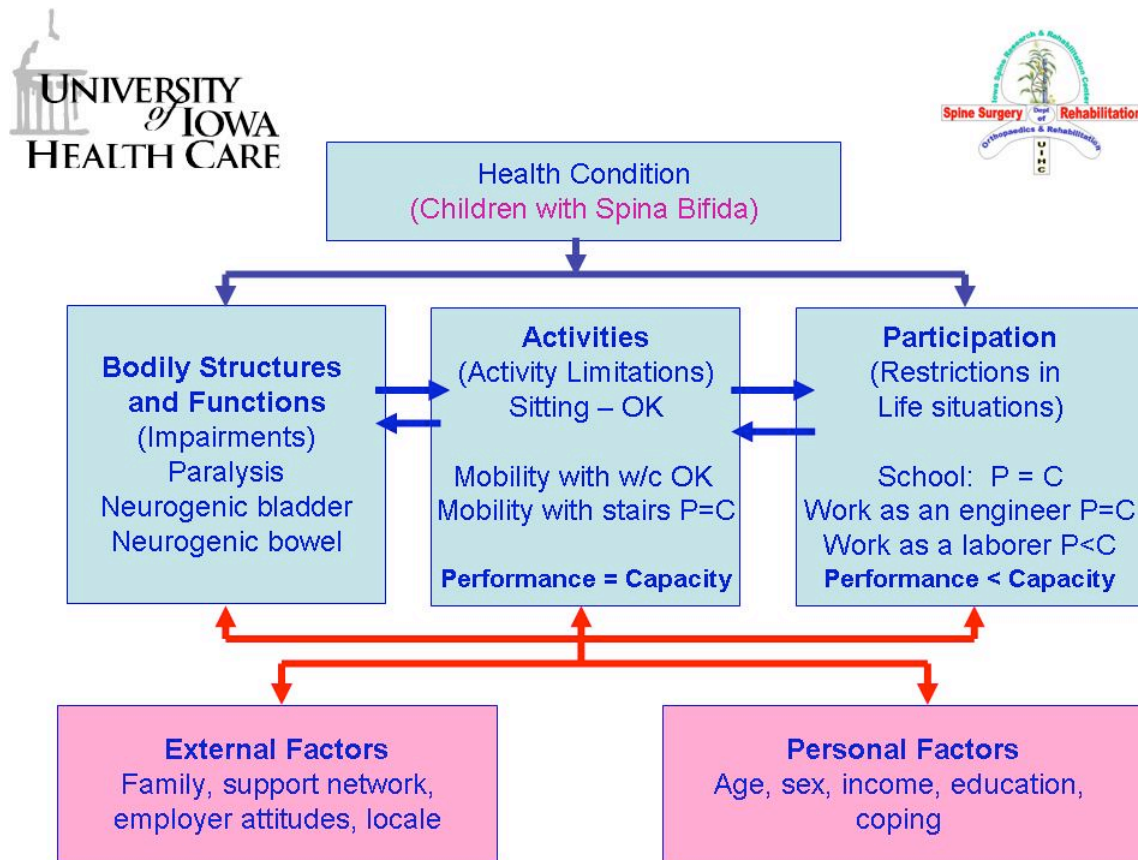


Figure 3. ICF Model for Children with Spina Bifida.

the using wheelchairs and other items to enable them to perform up to their best capacity. They should have few restrictions in their ability to go to school or find a reasonable workplace. However, if a particular child with spina bifida were placed solely in a position that required him to work a physically demanding occupation, his capacity might be less than his performance, thereby making him more susceptible to disability than a similar individual working as a professional engineer.

Taking the next step, we move on to using this ICF Model as was described in Wittink<sup>8</sup> et al. in the *Clinical Journal of Pain* in 2004. In this condition, adults with chronic back pain may have some limitation or impairment in pain, anxiety, range of motion, strength, endurance, cognition, attention, memory, sleep, or depression. They may also have difficulty in carrying out activities of daily living including sitting, standing, walking, or using stairs. Some may be able to sit and stand during the day, others may be able to walk only 2 blocks before they are limited by their neurogenic claudication. These activities in the blue box are easily measurable (Figure 4). However, the other boxes in the diagram

including Participation, Personal Factors, and External Factors are not easily measurable and can play pivotal roles in a patient's ability to function within society. These are exactly the missing links that indicate why a Functional Capacity Evaluation is not able to provide high predictive value of disability.

#### ICF MODEL FOR ADULT WITH CHRONIC BACK PAIN: TRAINING FOR THE OLYMPICS

I will conclude by adapting Wittink's diagram and including how these other factors are essential in the overall treatment of a patient with chronic back pain. In many senses, there are several dimensions that one needs to understand to train understand a complex problem such as chronic pain. There will obviously continue to be a need for physicians trained in the proper treatment of chronic pain. There will be a need for physical therapists who are skilled in the measurement of functional abilities, although it may not need to be with a full-scale functional capacity evaluation. The missing links include what our colleagues trained in vocational rehabilitation, social work, and psychology

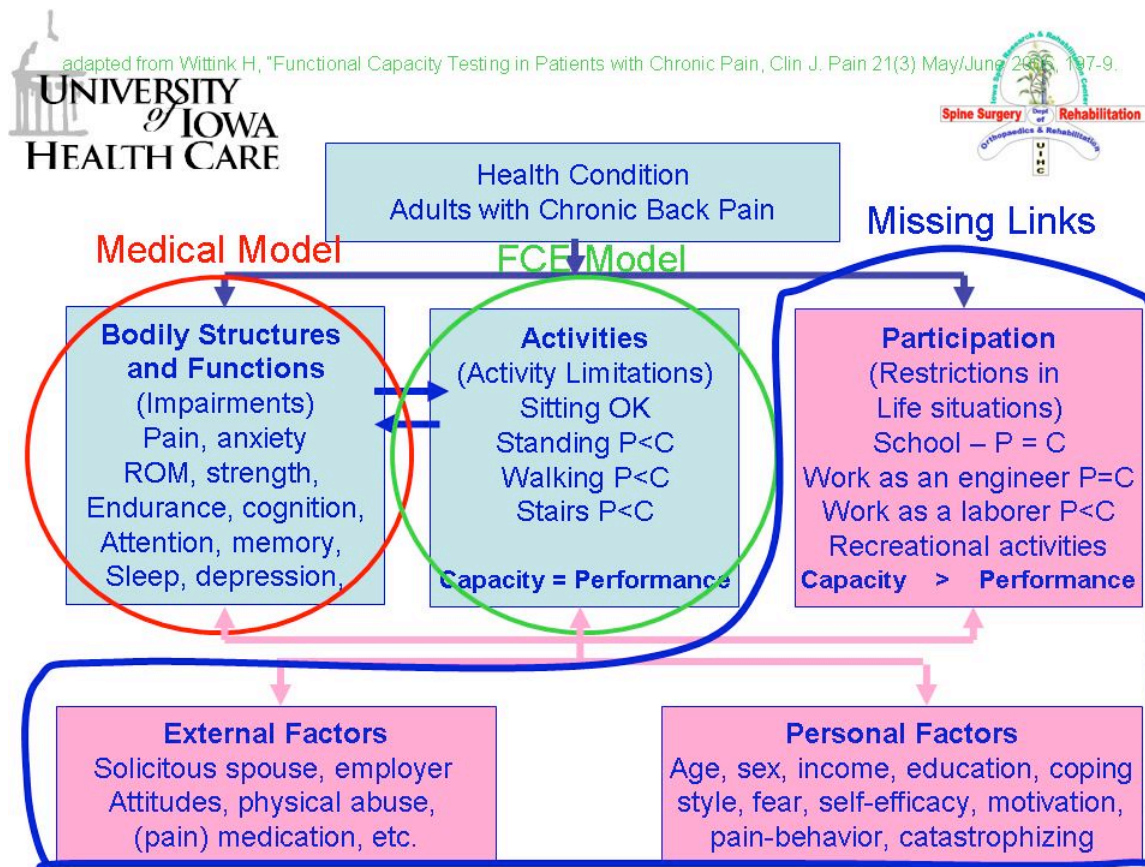


Figure 4. ICF Model from Wittink.

can add to improve a person's performance up to his or her capacity. The missing ring (Figure 5) includes those personal factors that are innate and are not likely to be changed with any of our interventions. While we need to respect that all people are different in their motivation and inner workings, we must make sure that we are not a part of the problem by becoming an enabler of chronic pain, confusing patients with the use of unnecessary pain medications, or further disabling them with our medical experience. By understanding these concepts we can provide our patients with excellent care and enable them to optimize their performance and capacity in fulfilling their societal roles.

## REFERENCES

1. Gouttebauge, V, Wind H, Paul P, Kuijer FM, Frings-Dresen. Reliability and validity of functional capacity evaluation methods: a systematic review with reference to Blankenship system, Ergos work simulator, Ergo-kit, and Isernhagen work system; *Int Arch Occup Environ Health* (2004) 77:527-537.
2. Reneman MF, Brouwer S, Meinema A, Dijkstra PU, Geertzen JHB, Groothoof JW. Test-Retest Reliability of the Isernhagen Work Systems Functional Capacity Evaluation in Adults, *J. Occupational Rehabilitation* 14(4):December 2004: 295-305.
3. Brouwer S, Reneman MF, Dijkstra PU, Groothoof JW, Schellekens JMH, Goeken LNH. Test-Retest Reliability of the Isernhagen Work Systems Functional Capacity Evaluation in Patients with Chronic Low Back Pain, *J. Occupational Rehabilitation* 13(4), December 2003: 207-218.
4. Gross DP, Battle MC, Cassidy JD. "The Prognostic Value of Functional Capacity Evaluation in Patients with Chronic Low Back Pain: Part 1: Timely Return to Work, *Spine* 29(8) 2004; 914-919.

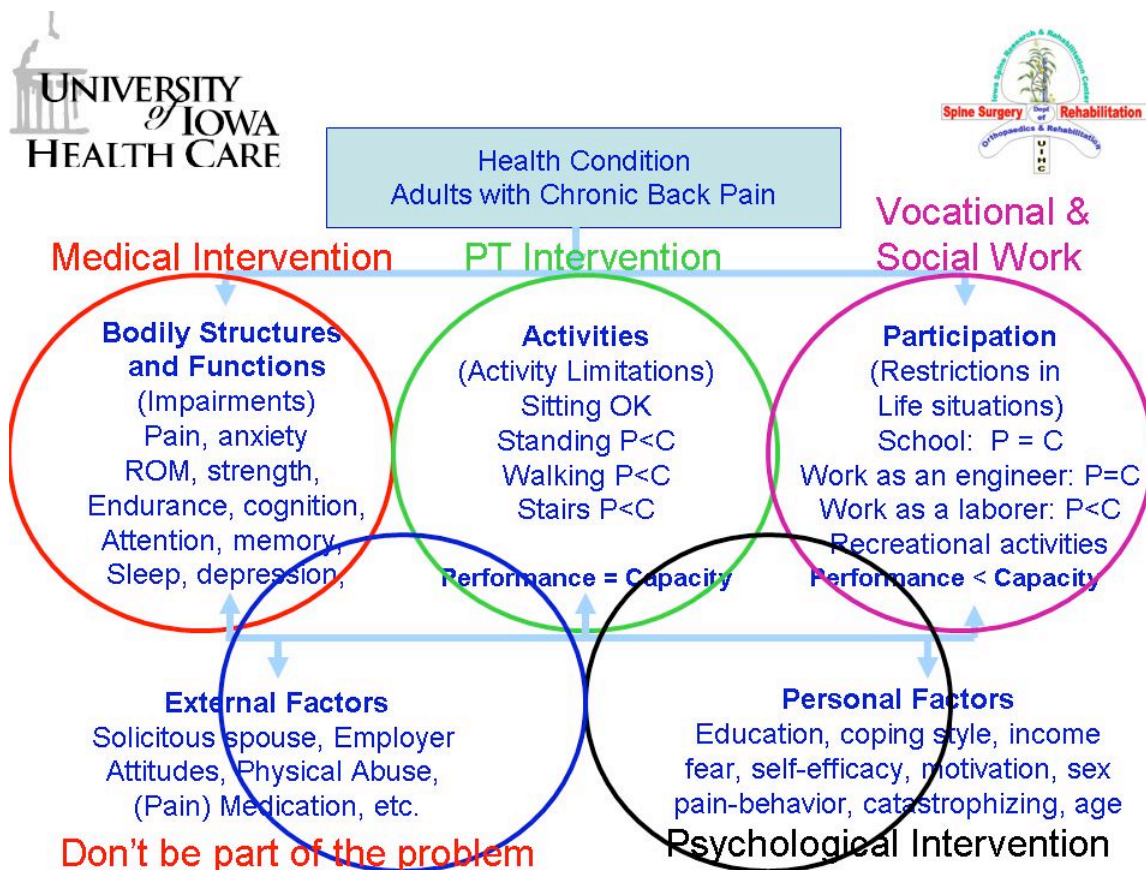


Figure 5. ICF Model of Disabling Back Pain.

5. **Gross DP, Battle MC.** The Prognostic Value of Functional Capacity Evaluation in Patients with Chronic Low Back Pain: Part 2: Sustained Recovery, *Spine* 29(8): 2004; 920-4.
6. **Gross DP, Battié MC.** Factors influencing results of functional capacity evaluations in workers' compensation claimants with low back pain. *Phys Ther* 2005 Apr; 85(4): 315-22
7. <http://www.unhcr.ch/cgi-bin/taxis/vtx/home/opensdoc.pdf?tbl=PROTECTION&id=3bb8209a2&page=PROTECT>
8. **Wittink H.** "Functional Capacity Testing in Patients with Chronic Pain, *Clin J. Pain* 21(3) May/June 2005, 197-199.